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ABSTRACT

The current curriculum modules under development at Project Solo are listed. The modules are grouped under the subject matter that they are designed to teach--algebra II, biology, calculus, chemistry, computer science, 12th grade math, physics, social science. Special programs written for use on the Hewlett-Packard Plotter are listed that may be used in conjunction with modules in the subjects referenced. A sequential listing of curriculum modules is also given. The relationship of the word size of a given programing language to the accuracy of calculations possible in that language is briefly explored. (JY)

ED056529

PROJECT SOLO

AN EXPERIMENT IN REGIONAL COMPUTING
FOR SECONDARY SCHOOL SYSTEMS*

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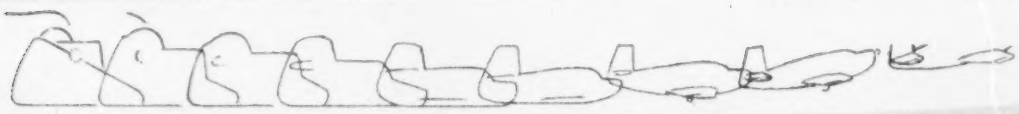
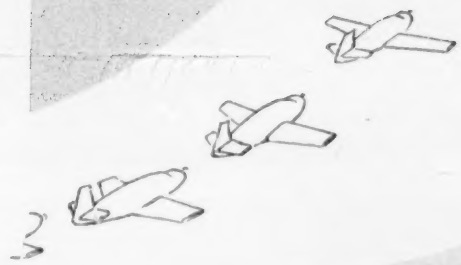




University of Pittsburgh • Department of Computer Science • Pittsburgh, Pennsylvania 15213

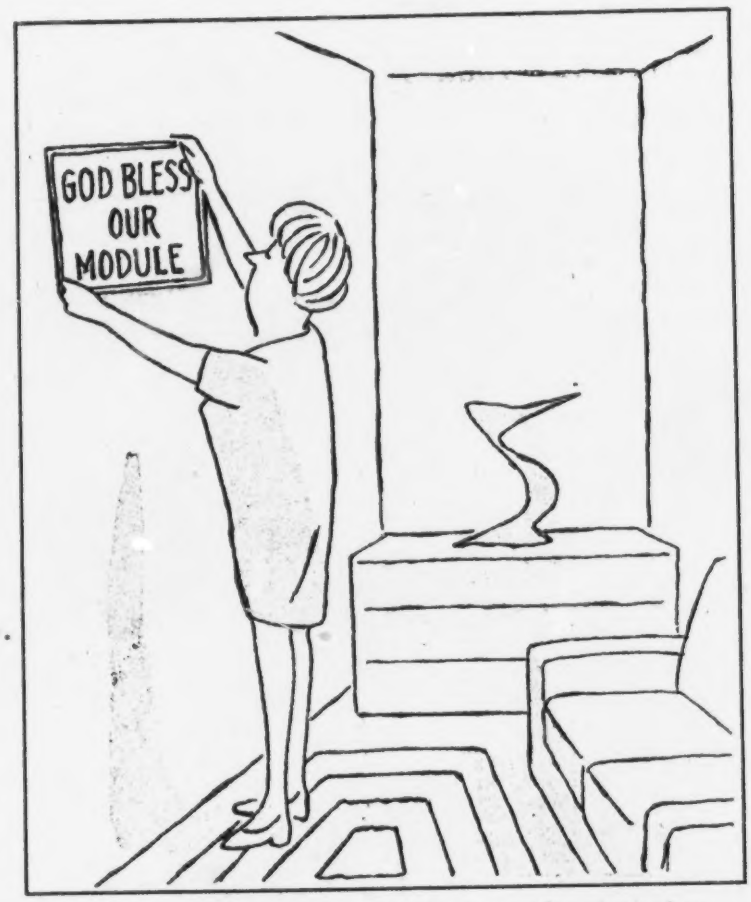
Newsletter No. 7

December 18, 1970

Curriculum Modules

This newsletter is being used to circulate our current listing of modules under development. If there are corrections or additions, please let Margot or Mary know.

Future newsletters will specialize by subject showing examples of modules along with the rationale used in selecting the key areas. Teachers in each area are invited to contribute information on their experiences with these units, or interesting extensions that they or their students have developed.



Double Precision in NEWBASIC

Two of the math modules we will be sending you explore the intriguing concept of high accuracy calculation of "transcendental" functions such as SINE, COSINE, LOG, etc. The accuracy possible with computers is related to the "word" size used in the machine, expressed in # of bits. NBS goes well beyond the capability of most other languages in this respect, as can be seen in the following comparison:

PIL
(IBM 360/50, 32 BIT WORD)

```
>1.1 SET X=13
>1.2 TYPE X/7.
>DØ PART 1
 X/7 =  1.857143
```

Normal NBS
(XDS 940, 48 BIT WORD)

```
>10 LET X=13
>20 PR. X/7.
>RUN

 1.857142857
```

DOUBLE PRECISION NBS
(XDS 940, 96 BIT WORD)

```
>10 DØUBLE REAL X
>20 LET X=13  PR. X/7.
>RUN

 1.857142857142857142
```

Many ideas in mathematics owe their origin to men who found fascination in numbers. Your students might use double precision to re-discover this world--say the recurring decimal property of rationals seen above.

CHRISTMAS GREETINGS: >RUN 166DM /J BELLS/ (McMillin's kids strike again!)

*Supported in part by NSF grant GJ 1077

EM 009 389

PROJECT SOLO

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FOR SECONDARY SCHOOL SYSTEMS

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PROJECT SOLO CURRICULUM LIST

Each subject has two lists associated with it. The list on the left of the page indicates topics that have been selected in consultation with teachers and subject experts as being representative of the key areas within that subject. The list in the right column of each page indicates Project Solo modules which are in development, or undergoing field evaluation. They are associated with the given key areas as shown, sometimes serving more than one subject.

File numbers from 0001 to 1999 are assigned sequentially to curriculum modules on a chronological basis. The numbers 2001 to 2999 are used for supplementary texts, manuals, work books. Numbers from 9001 to 9999 are used for programs that require use of a plotter or other graphical display unit. File numbers from 3001 to 8999 are being reserved to cross reference materials from other projects concerned with interactive computing.

(Revised 3/1/71)

Topics Extracted from Representative Syllabi	Modules in Progress	File Number
ALGEBRA II:		
Number Patterns, Series and Sequences	Limits of Sequences	0031
	Sum of a Series	0011
Special Products and Factoring		
Fundamental Operations		
Exponents and Roots (Synthetic Division)		
Complex Numbers	Drill on Complex Arithmetic	0074
Systems of Quadratic and Cubic Equations	Graphing by Computer	0044
Conic Sections	Conic Sections	0080
Sets and Set Theory	Introduction to Set Theory	0066
	Intermediate Set Theory	0103
Advanced Set Theory	Information Retrieval Modules	
Linear Functions		
Polynomial Functions	Evaluation of Polynomial Functions	0034
	Finding Roots of Polynomial Functions	0033
	Finding Minima and Maxima of Polynomials	0032
	Trig. Fctns.& Tchebychev Approx.	0060
Plotting Algebraic Functions	Graphing by Computer	0044
	Hewlett-Packard Plotter Modules	9001...
Introduction to Composite Functions		
Step Functions	Fourier Series & Trig. Functions	0065
Inverse Functions	Inverse Circular Functions	0061
Matrices	Communication Matrices	0045
	Matrix Operations	0107
Systems of Linear Equations	Systems of Linear Equations	0081
	Network Flow	0110
Linear Programming		
Quadratic Functions	The Quadratic Equation	0082

Curriculum List 3

Topics Extracted from Representative Syllabi	Modules in Program	File Number
BIOLOGY:		
Tools of the Biologist	Tools of the Biologist	0085
The Scientific Method	The Scientific Method	0087
History of Biology	History of Biology	0088
Evolution	Quiz on Evolution	0042
Classification of Taxonomy	Maple Key	0005
Ecological Systems	Cat-Mouse Simulation of Predator-Prey	0089
Biochemistry	The Ecology-Monopoly Game	0090
Heredity	Mendel I,II,III	0040
	Hardy-Weinberg	0041
Cytology	Cell Multiplication	0092
Development		
Reproduction		
Organ Systems		
Human Anatomy and Physiology		
Behavior		
Photosynthetic Systems		

Topics Extracted from Representative Syllabi	Modules in Progress	File Number
CALCULUS:		
Definite Integral	Approximating Definite Integrals	0017
Slopes of Tangent Lines	Slopes of Tangent Lines	0018
Definition of a Limit	Limits of Functions Definition of a Limit	0019 0037
Continuity	Continuity	0070
Curve Sketching	Graphing Functions and Their First and Second Derivatives	0094
Functions	Limits of Functions	0019
Approximating Areas	Approximating Areas	0049
	Using Limits of Sequences to Define Areas	0064
	Monte Carlo Integration	0111
Derivatives	Detecting Derivatives	0046
	Derivative Function of sin(x)	0104
	Derivative Functions of Various Functions	0105
	Approximating the Value of a Derivative	0106
Limits of Sequences	Limits of Sequences	0036
Infinite Series	Limits of Sums of Sequences	0121
Fundamental Theorem of Integral Calculus	Fundamental Theorem of Integral Calculus	0122
Differential Equations	Solving Differential Equations	0123

Topics Extracted from Representative Syllabi	Modules in Progress	File Number
CHEMISTRY:		
Matria System	Matria System	0047
Gas Laws (Boyle's Law, Charles' Law, Combi. Law)	Gas Laws	0068
Stoichiometry: Part A (Weight-Weight, Volume-Weight, Volume-Volume)	Weight-Weight, Volume-Weight, Volume-Volume (Willie Wildcat)	0050
Periodic Table	Mystery of the Periodic Table	0008
Stoichiometry: Part B (Concentration)	Concentration (Superchemist)	0051
Kinetics		
pH	pH(Revision)	0084
Equilibrium	Equilibrium	0052
Summary: Prep. for Final	Chem. Quiz (A Drill and Practice for Final Exam)	0048

Topics Extracted from Representative Syllabi	Modules in Progress	File Number
COMPUTER SCIENCE:		
Algorithmic Thinking Verification of specification Certainty of termination Primitive logical steps Proof of correctness	A Primer for the NEWBASIC/ CATALYST System	2001
Data Representation Symbols Numbers (exact & approx.) Synthetic structures	Converting Bases of Numbers	0069
	Distance and Error-Correcting Codes	0038
	Elementary Geometric Figures	0097
Coding Redundancy Space vs. Time	Graphing by Computer	0044
	List Structures	0093
	Tree Structures	0095
	Communication Matrices	0045
Control Varieties Transfer Loops Iteration Recursion Co-routines Non-determinism	Iteration-Square Roots	0096
Synthetic Languages Grammars Recognizers Analyzers Translators	Intro. Set Theory (Parsing Algorithms)	0066
	Mini-Comp (Assembler Lang.)	0100
	Assemblers (XAP and TAP)	0101
	PDP Simulators	0115
Idealized Machines Finite State Stack Turing Relation to Languages		
Machine Intelligence Games and Puzzles Pattern Recognition Natural Languages	Green Valley (Linguistics)	0043
	New Writing Team (String Manipulation)	0004
	Learning Basic at the Terminal	0091
	Reverse English (String manipulation)	0001
	Story Writing (String Manipulation)	0039
	Tic-Tac-Toe on Plotter	9017
	Super-Tutorial: Laws of Sines, Cosines	0112

Topics Extracted from Representative Syllabi	Modules in Progress	File Number
COMPUTER SCIENCE (CONTINUED):		
Simulation	Billiard Ball Simulation	9007
Traffic	Analogue Simulation	0102
Ballistics	Negotiation Simulation	0108
Flows	Simulation (Quite a few of the modules from other subjects will serve as starting points and/or examples under this heading)	0099
Numerical Problems	Trig. Functions and Tchebychev Approximations	0060
Linear Equations		
Confidence of results	Elementary Geometric Figures	0097
Continued fractions	Systems of Linear Equations	0081
Optimization problems		
File Processing	Grade Averaging Program and Other Classroom Aids	0009
Sorting		
Buffering	Electronic Data Processing	0098
Memory media	Mini-Market	0109
Economics of computing	File-Oriented CAI	0114
Supplementary Material		
NEWBASIC/CATALYST	A Primer for the NEWBASIC/CATALYST System	2001
	NEWBASIC/CATALYST Reference Manual	2002
	NEWBASIC/CATALYST Cue Card	2003
Other Processors	SNOBOL Manual	2004
	XTRAN Manual	2005
	QED Manual	2006
	CRS Primer	2007
	CRS Manual	2008
Miscellaneous Applications		
Music: Rhythm	Jingle Bells	0116
Composition	Melody Production	0117
Harmony	Automated Harmony	0118
Tone Quality	Synthesizer Control	0119
Marching Band	Marching Formation Generator	0120
English: Vocab. Drill	File-Oriented CAI	0114
Linguistics	Green Valley	0043
Composition	New Writing Team	0004
	Story Writing	0039
Art	See various H-P plotter routines	9001...
	Non-computer, see module covers, some student-produced.	

Topics Extracted from Representative Syllabi	Modules in Progress	File Number
12TH GRADE MATH:		
Review of Algebra II: Distance Formulae	Hyperspace	0012
Polynomial Functions of Degree N	Real Roots of a Quadratic Equation	0010
	Bisection Method for Finding Roots	0071
	Newton's Method for Finding Roots	0072
Trigonometric Functions	Conversion From Radian Measure to Degree Measure	0023
	Solving Oblique Triangles, Direct Mode	0022
	Circular Functions	0062
	Inverse Circular Functions	0061
	Review of Trigonometric Identities	0024
	Pythagorean Theorem	0059
	Area of a Triangle	0058
	Phantom Vortac	0021
	Trigonometric Functions and Tchebychev Approximations	0060
	Fourier Series and the Trigonometric Functions	0065
	Circular Functions - Tutorial	0063
	Super-Tutorial: Laws of Sines; Cosines	0112
Complex Numbers	Drill on Complex Arithmetic	0074
Polar Coordinate Geometry	Hewlett-Packard Plotter Modules (See Page 9)	9001...
Greatest Integer	The 23 Skidoo Game	0075
Conic Sections	Conic Sections	0080
Indication of Conic, Given Quadratic Expression in Two Variables	Elliptical Billiard Table	0113
Translation of Axes		
Rotation of Axes		

Topics Extracted from Representative Syllabi	Modules in Progress	File Number
12TH GRADE MATH (CONTINUED):		
Vectors	Introduction to Vectors	0025
	Billiard Simulation	9007
	Bouncing Ball	9001
Permutations	Factorial Program	0076
	The Hot-Dog Problem	0077
Combinations	Enumeration	0057
Probability	Probability	0014
	Monte Carlo Integration	0111
Sequences and Series	Sum of a Series	0011
	Limits of Sequences	0031
Midpoint of a Line Segment	Midpoint of a Line Segment	0003
Sets	Introduction to Set Theory	0066
	Intermediate Set Theory	0103
Enumeration	Enumeration	0057
Logarithmic Functions		
Exponential Functions	Population Growth	0078
Absolute Value		
Advanced Set Theory	Information Retrieval Modules	
Matrices	Communication Matrices	0045
	Matrix Operations	0107
Systems of Linear Equations	Systems of Linear Equations	0081
	Network Flow	0110

Topics Extracted from Representative Syllabi	Modules in Progress	File Number
PHYSICS:		
Metric System	MKS System (I,II,III)	0083
Vectors	Vectors	0053
	Billiard Simulation	9007
Newton's Laws of Motion	Newton's Laws of Motion	0020
Circular Motion	Circular Motion (I,II,III,IV)	0007
Kepler's Laws	Kepler's Laws	0055
	Orbital Mechanics (Dartmouth)	8001
Optics	Billiard Simulation	9007
Wave Motion		
Mechanical Energy		
Conservation of Momentum	Conservation of Momentum	0054
Conservation of Mass-Energy		
Static Electricity		
Kirchoff's Laws	Systems of Linear Equations	0081
Kinetic Theory		
Electricity and Magnetism	Electric Fields (on Plotter)	9013
Particle Physics	Billiard Simulation	9007
Electronics		

Topics Extracted from Representative Syllabi	Modules in Progress	File Number
SOCIAL SCIENCE:		
I. World Cultures:		
World War I (Cause and effect)		
World War II		
Sub-Saharan Africa-- Economic, Social, Educational Development	Discover the Country: Africa	0006
China Since 1900-- Political, Economic, Social, Educational Development		
Depression (Cause and effect)		
Enlightenment and French Revolution		
Growth of Communism and Socialism (Especially in Russia)		
Growth of Democracy		
Growth of International Government (League of Nations and United Nations)		
Growth of Nationalism (Especially in Germany and Italy)		
India Since 1900-- Political, Economic, Educational Development		
Middle Ages		
Renaissance		
Reformation		
The Advent of Fascism in Italy and Germany	Preface to Hitler	0026
Statistics and Geography	Statistics and Geography	0030

Topics Extracted from Representative Syllabi	Modules in Progress	File Number
SOCIAL SCIENCE:		
II. American Democracy:		
Private Business		
Consumer Buying		
Economic Growth		
Labor Unions		
Laisses-Faire, U.S.		
Legislative Powers and Decision Making Process	Congressman Game	0027
Mass Media and Propaganda	Communication Matrices	0045
Presidents and Qualifications		
The Role of Political Parties		
The Supreme Court		
Stock Market	Mini-Market	0109
	Stock Market Simulation	0028
Population Pressure and Environmental Deterioration	Survival Game	0029
	Ecology-Monopoly Game	0090
Conflict in a Free Society	Confrontation	0015
	Negotiation Simulation	0108

HEWLETT-PACKARD PLOTTER PROGRAMS

This page lists special programs written for use on the Hewlett-Packard Plotter. These are not modules but supplementary routines that can be used in conjunction with modules in the subjects referenced.

Plotter Program Name	File Number	Subject(s) Cross-Reference
Bouncing Ball (Inelastic Collision)	9001	Physics, Vector Mathematics
/SINTAN/	9002	Calculus
/SINPETAL/	9003	Analytic Geometry, Polar Coordinates
/COSPETAL/	9004	" "
/CARDIOID/	9005	" "
/VALENTINE/	9006	" "
Billiard Simulation (Elastic Collision in a ported box)	9007	Physics, Vector Mathematics
Pantograph	9008	Geometry
Zoom Lens	9009	"
Diagonals of a Polygon	9010	"
Sin Waves (Animated Movie Generator)	9011	"
Startrek	9012	"
Electric Fields	9013	Physics
Three-D Illusions	9014	Art
Isometric Drawing	9015	Engineering Drawing
Two-Aircraft Navigation Rally	9016	Trigonometry,Physics
TIC-TAC-TOE	9017	Computer Science

SEQUENTIAL LISTING OF CURRICULUM MODULES

0001	REVERSE ENGLISH (STRING MANIPULATION)	COMP SCI
0002	OBSOLETE	
0003	MIDPOINT OF A LINE SEGMENT	MATH 12
0004	NEW WRITING TEAM (STRING MANIPULATION)	COMP SCI
0004	NEW WRITING TEAM (STRING MANIPULATION)	COMP SCI(MISC)
0005	MAPLE KEY	BIO
0006	DISCOVER THE COUNTRY# AFRICA	SOC SCI
0007	CIRCULAR MOTION	PHYSICS
0008	MYSTERY OF THE PERIODIC TABLE	CHEM
0009	GRADE AVERAGING PROGRAM AND OTHER CLASSROO	COMP SCI
0010	REAL ROOTS OF A QUADRATIC EQUATION	MATH 12
0011	SUM OF A SERIES	MATH 12
0011	SUM OF A SERIES	ALG II
0012	HYPERSPACE	MATH 12
0013	OBSOLETE	
0014	PROBABILITY	MATH 12
0015	CONFRONTATION	SOC SCI
0016	OBSOLETE	
0017	DEFINITE INTEGRAL	CALC
0018	SLOPES OF TANGENT LINES	CALC
0019	LIMITS OF FUNCTIONS	CALC(DEF)
0019	LIMITS OF FUNCTIONS	CALC(FUNCTNS)
0020	NEWTON,S LAWS OF MOTION	PHYSICS
0021	PHANTOM VORTAC	MATH 12
0022	SOLVING OBLIQUE TRIANGLES, DIRECT MODE	MATH 12
0023	CONVERSION FROM RADIAN MEASURE TO DEGREE M	MATH 12
0024	REVIEW OF TRIGONOMETRIC IDENTITIES	MATH 12
0025	INTRODUCTION TO VECTORS	MATH 12
0026	PREFACE TO HITLER	SOC SCI
0027	CONGRESSMAN GAME	SOC SCI
0028	STOCK MARKET SIMULATION	SOC SCI
0029	SURVIVAL GAME	SOC SCI
0030	STATISTICS AND GEOGRAPHY II	SOC SCI
0031	LIMITS OF SEQUENCES	ALG II
0031	LIMITS OF SEQUENCES	MATH 12
0032	FINDING MINIMA & MAXIMA OF POLYNOMIALS	ALG II
0033	FINDING ROOTS OF POLYNOMIAL FUNCTIONS	ALG II
0034	EVALUATION OF POLYNOMIAL FUNCTIONS	ALG II
0035	OBSOLETE	
0036	LIMITS OF SEQUENCES	CALC
0037	DEFINITION OF A LIMIT	CALC
0038	DISTANCE AND ERROR-CORRECTING CODES	COMP SCI
0039	STORY WRITING (STRING MANIPULATION)	COMP SCI
0039	STORY WRITING (STRING MANIPULATION)	COMP SCI(MISC)
0040	MENDEL I,II,III	BIO
0041	HARDY-WEINBERG	BIO
0042	QUIZ ON EVOLUTION	BIO
0043	GREEN VALLEY (LINGUISTICS)	COMP SCI
0043	GREEN VALLEY	COMP SCI(MISC)
0044	GRAPHING BY COMPUTER	COMP SCI
0044	GRAPHING BY COMPUTER	ALG II (QUAD & CUBIC)
0044	GRAPHING BY COMPUTER	ALG II(PLOTTING FUNCTIONS)
0045	COMMUNICATION MATRICES	SOC SCI
0045	COMMUNICATION MATRICES	ALG II
0045	COMMUNICATION MATRICES	MATH 12
0046	DETECTING DERIVATIVES	CALC
0047	METRIC SYSTEM	CHEM
0048	CHEM. QUIZ	CHEM
0049	APPROXIMATING AREAS	CALC
0050	WT.-WT., VOL.-WT., VOL.-VOL.(WILLIE WIZBAN	CHEM
0051	CONCENTRATION (SUPERCHEMIST)	CHEM
0052	EQUILIBRIUM	CHEM
0053	VECTORS	PHYSICS
0054	CONSERVATION OF MOMENTUM	PHYSICS
0055	KEPLER'S LAWS	PHYSICS
0056	OBSOLETE	
0057	ENUMERATION	MATH 12(ENUM)
0057	ENUMERATION	MATH 12(COMB)
0058	AREA OF A TRIANGLE	MATH 12
0059	PYTHAGOREAN THEOREM	MATH 12
0060	TRIGONOMETRIC FUNCTIONS AND TCHEBYCHEV APP	COMP SCI
0060	TRIGONOMETRIC FUNCTIONS AND TCHEBYCHEV APP	ALG II
0060	TRIGONOMETRIC FUNCTIONS AND TCHEBYCHEV APP	MATH 12
0061	INVERSE CIRCULAR FUNCTIONS	MATH 12
0061	INVERSE CIRCULAR FUNCTIONS	ALG II
0062	CIRCULAR FUNCTIONS	MATH 12
0063	CIRCULAR FUNCTIONS TUTORIAL	MATH 12
0064	USING LIMITS OF SEQUENCES TO DEFINE AREAS	CALC
0065	FOURIER SERIES AND THE TRIGONOMETRIC FUNCT	ALG II
0065	FOURIER SERIES AND THE TRIGONOMETRIC FUNCT	MATH 12

0066	INTRODUCTION TO SET THEORY	ALG II
0066	INTRODUCTION TO SET THEORY	COMP SCI
0066	INTRODUCTION TO SET THEORY	MATH 12
0067	OBSOLETE	
0068	GAS LAWS	CHEM
0069	CONVERTING BASES OF NUMBERS	COMP SCI
0070	CONTINUITY	CALC
0071	BISECTION METHOD FOR FINDING ROOTS	MATH 12
0072	NEWTON'S METHOD FOR FINDING ROOTS	MATH 12
0073	OBSOLETE	
0074	DRILL ON COMPLEX ARITHMETIC	ALG II
0074	DRILL ON COMPLEX ARITHMETIC	MATH 12
0075	TWENTY-THREE SKIDOO GAME	MATH 12
0076	FACTORIAL PROGRAM	MATH 12
0077	HOT-DOG PROBLEM	MATH 12
0078	POPULATION GROWTH	MATH 12
0079	OBSOLETE	
0080	CONIC SECTIONS	ALG II
0080	CONIC SECTIONS	MATH 12
0081	SYSTEMS OF LINEAR EQUATIONS	ALG II
0081	SYSTEMS OF LINEAR EQUATIONS	MATH 12
0081	SYSTEMS OF LINEAR EQUATIONS	COMP SCI
0081	SYSTEMS OF LINEAR EQUATIONS	PHYSICS
0082	QUADRATIC EQUATION	ALG II
0083	MKS SYSTEM	PHYSICS
0084	PH	CHEM
0085	TOOLS OF THE BIOLOGIST	BIO
0086	OBSOLETE	
0087	THE SCIENTIFIC METHOD	BIO
0088	HISTORY OF BIOLOGY	BIO
0089	CAT-MOUSE SIMULATION OF PREDATOR-PREY	BIO
0090	ECOLOGY-MONOPOLY GAME	BIO
0090	THE ECOLOGY-MONOPOLY GAME	SOC SCI
0091	LEARNING BASIC AT THE TERMINAL	COMP SCI
0092	CELL MULTIPLICATION	BIO
0093	LIST STRUCTURES	COMP SCI
0094	GRAPHING FUNCTNS & THEIR 1ST & 2ND DERIVAT	CALC
0095	TREE STRUCTURES	COMP SCI
0096	ITERATION - SQUARE ROOTS	COMP SCI
0097	ELEMENTARY GEOMETRIC FIGURES	COMP SCI(SYN STRUC)
0097	ELEMENTARY GEOMETRIC FIGURES	COMP SCI(CONFID)
0098	ELECTRONIC DATA PROCESSING	COMP SCI
0099	SIMULATION	COMP SCI
0100	MINI-COMP (ASSEMBLER LANGUAGE)	COMP SCI
0101	ASSEMBLERS (XAP AND TAP)	COMP SCI
0102	ANALOGUE SIMULATION	COMP SCI
0103	INTERMED. SET THEORY	ALG II
0103	INTERMED. SET THEORY	MATH 12
0104	DERIVATIVE FUNCTION OF SIN(X)	CALC
0105	DERIVATIVE FUNCTNS OF VARIOUS FUNCTIONS	CALC
0106	APPROXIMATING THE VALUE OF A DERIVATIVE	CALC
0107	MATRIX OPERATIONS	ALG II
0107	MATRIX OPERATIONS	MATH 12
0108	NEGOTIATION SIMULATION	COMP SCI
0108	NEGOTIATION SIMULATION	SOC SCI
0109	MINI-MARKET	SOC SCI
0109	MINI-MARKET	COMP SCI
0110	NETWORK FLOW	MATH 12
0110	NETWORK FLOW	ALG II
0111	MONTE CARLO INTEGRATION	CALC
0111	MONTE CARLO INTEGRATION	MATH 12
0112	SUPER-TUTORIAL# LAWS OF SINES+ COSINES	MATH 12
0112	SUPER-TUTORIAL# LAWS OF SINES, COSINES	COMP SCI
0113	ELLIPTICAL BILLIARD TABLE	MATH 12
0114	FILE-ORIENTED CAI	COMP SCI(MISC)
0114	FILE - ORIENTED CAI	COMP SCI
0115	PDP SIMULATORS	COMP SCI
0116	JINGLE BELLS	COMP SCI(MISC)
0117	MELODY PRODUCTION	COMP SCI(MISC)
0118	AUTOMATED HARMONY	COMP SCI(MISC)
0119	SYNTHESIZER CONTROL	COMP SCI(MISC)
0120	MARCHING FORMATION GENERATOR	COMP SCI(MISC)
0121	LIMITS OF SUMS OF SEQUENCES	CALC
0122	FUNDAMENTAL THEOREM OF INTEGRAL CALCULUS	CALC
0123	SOLVING DIFFERENTIAL EQUATIONS	CALC
2001	A PRIMER FOR THE NEWBASIC/CATALYST SYSTEM	COMP SCI(ALGO.)
2001	A PRIMER FOR THE NEWBASIC/CATALYST SYSTEM	COMP SCI(SUPPLMT)
2003	NEWBASIC/CATALYST CUE CARD	COMP SCI
2004	SNOBOL MANUAL	COMP SCI
2005	XTRAN MANUAL	COMP SCI

2006	QED MANUAL	COMP SCI
2007	CRS PRIMER	COMP SCI
2008	CRS MANUAL	COMP SCI
8001	ORBITAL MECHANICS	PHYSICS
9001	BOUNCING BALL	MATH 12
9002	/SINTAN/	CALC
9003	/SINPETAL/	MATH 12
9004	/COSPETAL/	MATH 12
9005	/CARDIOID/	MATH 12
9006	/VALENTINE/	MATH 12
9007	BILLIARD SIMULATION	PHYSICS(VECTORS)
9007	BILLIARD SIMULATION	PHYSICS(OPTICS)
9007	BILLIARD SIMULATION	PHYSICS(PARTICLES)
9007	BILLIARD SIMULATION	MATH 12
9007	BILLIARD SIMULATION	COMP SCI
9008	PANTOGRAPH	GEOMETRY
9009	ZOOM LENS	GEOMETRY
9010	DIAGONALS OF POLYGON	GEOMETRY
9011	SIN WAVES (ANIMATED MOVIE GENERATOR)	MATH 12
9012	STARTRECK	COMP SCI(MISC)
9013	ELECTRIC FIELDS	PHYSICS
9014	THREE-D ILLUSIONS	COMP SCI(MISC)
9015	ISOMETRIC DRAWINGS	COMP SCI(MISC)
9016	TWO-AIRCRAFT NAV. RALLY	MATH 12
9017	TIC-TAC-TOE ON PLOTTER	COMP SCI